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Letter to the Editor

Change in near-infrared spectroscopy of a coronary artery after 1-year treatment with high dose rosuvastatin

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Several well-established and new cardiovascular risk factors have been related to the occurrence and progression of cardiovascular disease (CVD) [1,2]. Early detection of the disease in the coronary arteries by means of non-invasive and invasive imaging is highly desirable to better stratify the risk of a patient for a coronary event.

A catheter-based near-infrared spectroscopy system (NIRS) (InfraReDx, Burlington, USA) is a novel imaging modality that determines tissue composition [3,4]. This intra-coronary system utilizes the variation in reflection of the emitted near-infrared light to detect vulnerable lipid-core containing plaques (LCP), visible as a "yellow spot", and provides two quantitative measurements, namely a (block) chemogram and a lipid-core burden index (LCBI) score [5]. The identification and measurement of these modalities could serve as important parameters in the prevention and treatment of CVD, since there is a close relationship between vulnerable plaque and cardiovascular events [6]. The intake of a high dose statin could improve these NIRS-derived parameters of a non-intervened coronary artery segment. We present a case that illustrates the results of this concept.

Case 1: A 44-year old man with inferior wall ST-elevation myocardial infarction was referred to our tertiary clinic for a primary percutaneous coronary intervention (PCI). He had no cardiac history and the known cardiac risk factors were hypertension, hypercholesterolemia and obesity (BMI of 33.9 kg/m^2). The lipid profile of the statin-naïve patient was an LDL-cholesterol level of 4.0 mmol/L (upper limit of 4.1 mmol/L), HDL-cholesterol level of 1.0 mmol/L (lower limit of 1.55 mmol/L) and a total cholesterol/HDL-cholesterol ratio of 5.7 (upper limit of 4.0).

The thrombus in the left anterior descending coronary artery segment 6 was aspirated (Medtronic, Minneapolis, USA) and subsequently treated with an everolimus-eluting 3.5×18 mm stent (XIENCE V, Abbott vascular systems, Santa Clara, USA). Angiography of the co-dominant right coronary artery showed a lesion in segment 3 for which a staged PCI-procedure was planned five days later (Fig. 1). The NIRS-catheter was used to make images proximal of the implanted stent in the right coronary artery (Fig. 1). The patient had a baseline LCBI score of 114. One week after the procedure, the patient was seen in the outpatient clinic, where a daily dose of 40 mg of rosuvastatin was prescribed as part of the IBIS-3 study, for which the patient provided informed consent [7]. After 1 year of high dose rosuvastatin treatment, the lipid profile had improved when compared to baseline. The LDL-cholesterol level decreased to 2.8 mmol/L (−30%), the HDL-cholesterol level increased to 1.3 mmol/L (+30%) and the total cholesterol/HDL-cholesterol ratio improved from 5.7 to 3.4 (−40%). The diagnostic catheterization after 1 year, scheduled as part of the IBIS-3 study, showed no lesions in the coronary arteries or in-stent restenosis. The LCBI score of the matched region of interest was reduced from 114 to 14 (Fig. 1). The amount of the "tanned" block chemograms was reduced from 11 to 2. A yellow spot appeared in the chemogram on an initially non-LCP containing location (Fig. 1).

The amount of LCP for each scanned arterial segment in the region of interest is displayed as a chemogram, with the x-axis indicating the pullback position in millimeters and the y-axis the circumferential position of the measurement in degrees, while the probability of LCP present is coded on a color scale from red to yellow (0 for red and 1 for yellow). The chemogram block utilizes a binned color scale, in which pixels that are exceeding a pre-specified threshold of 60% turn to yellow, which is representative of a LCP. The LCBI score summarizes the fraction of LCP in the imaged section of the coronary vessel on a 0-to-1000 scale. Our previous study showed that (1) plaques coded as yellow were associated with significantly larger plaque size (mm^2) compared to those coded as red and that (2) plaque coded as yellow was weakly correlated with more necrotic core as assessed with virtual histology-intravascular ultrasound [8]. A recent

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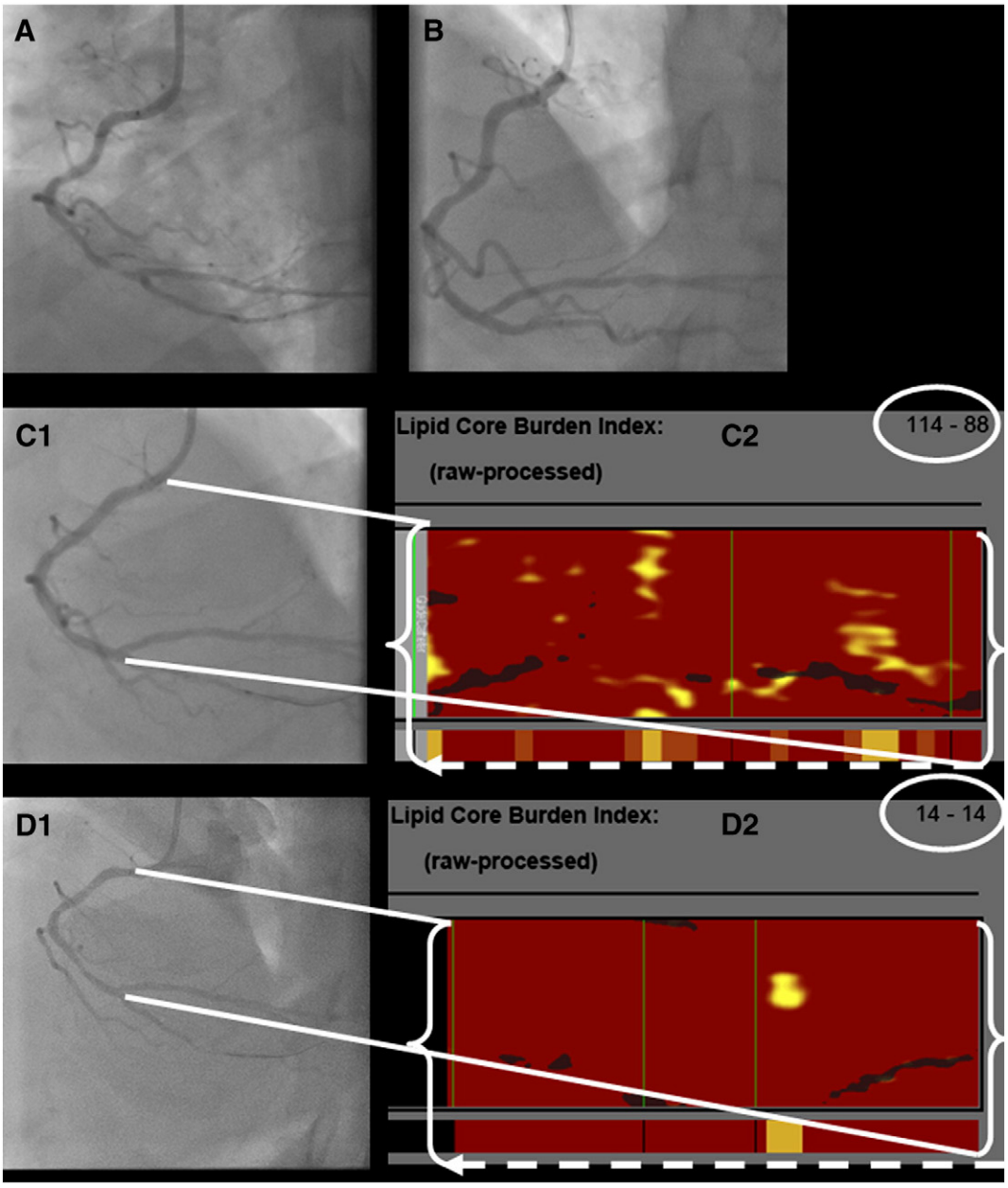

Fig. 1. (A) The right coronary artery showing a significant lesion in segment 3. (B) The lesion in the right coronary artery has been treated with a Xience V 2.5×12 mm stent. (C1) Baseline lipiscan landmarks, correlating with the chemogram in C2. (D1) The follow-up lipiscan landmarks are matched with the index procedure. The chemogram in D2 shows a decrease in the LCBI score compared with the baseline LCBI score.

study showed that the mean LCBI scores of patients with an acute syndrome tended to be higher than of patients with stable angina (82 vs. 57, P = 0.05) [5]. The baseline LCBI score of 114 of our patient could therefore be classified as relatively high.

It has been shown that the inter-catheter reproducibility of NIRS for the detection of coronary lipid core plaques is high and that NIRS is suitable to assess the status of LCP over time and in response to novel treatment [9]. The usage of a high dose rosuvastatin did not only improve the lipid profile of the statin-naive patient, but also led to an evident decrease in LCBI score of the non-intervened coronary artery segment. Noteworthy is the appearance of a LCP in a previously non-lipid core containing plaque region. Whether this is an unidentified LCP at baseline or a newly formed LCP is unknown. The effect of a high dose rosuvastatin on the LCP is currently being studied in the IBIS-3 study [7].

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The authors of this manuscript have certified that they complied with the Principles of Ethical Publishing in the International Journal of Cardiology (Shewan and Coats 2010:144:1-2).

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